

# 1

## INTRODUCTION

*"Jealous stepmother and sisters; magical aid by a beast; a marriage won by gifts magically provided; a bird revealing a secret; a recognition by aid of a ring; or show; or what not; a dénouement of punishment; a happy marriage - all those things, which in sequence, make up Cinderella, may and do occur in an incalculable number of other combinations. "*

— MR. Cox **1893**, *Cinderella: Three hundred and forty-five variants* [?] ]

cd

**TODO** Recent papers first. Mention Workshops instead in conference. "Proceedings of XXXX". Add the pages in the papers list.

### 1.1 Background

**TODO** Motivate with the open challenges.

### 1.2 Problem statement

**TODO** Problem statement **TODO** Set the requirements as R1, R2, then map each contribution to them.

### 1.3 Automatic Software diversification requirements

1. 1: **TODO** Requirement 1

### 1.4 List of contributions

**TODO** Describe each one

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<sup>0</sup>Comp. time 2023/10/23 10:00:32

Contribution	Research papers			
	P1	P2	P3	P4
C1 Experimental contribution	✓	✓	✓	✓
C2 Theoretical contribution	✓		✓	
C3 Diversity generation	✓	✓	✓	✓
C4 Defensive diversification	✓	✓	✓	
C5 Offensive diversification				✓

Table 1.1

**C1 Experimental contribution:** We propose reproducible methodology for generating software diversification for WebAssembly, the assessment of the generated diversity and the exploitation of the generated variants.

**C2 Theoretical contribution:** We propose a theoretical foundation in order to improve Software Diversification for WebAssembly.

**C3 Diversity generation:** We generate WebAssembly program variants.

**C4 Defensive Diversification:** We assess how generated WebAssembly program variants could be used for defensive purposes.

**C5 Offensive Diversification:** We assess how generated WebAssembly program variants could be used for offensive purposes, yet improving security systems.

## 1.5 Summary of research papers

This compilation thesis comprises the following research papers.

### P1: CROW: Code randomization for WebAssembly bytecode.

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**P2: Multivariant execution at the Edge.**

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**P3: Wasm-mutate: Fast and efficient software diversification for WebAssembly.**

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**P4: WebAssembly Diversification for Malware evasion.**

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## ■ Thesis layout

0 This dissertation comprises two parts as a compilation thesis. Part one summarises the research papers included within, which is partially rooted in the author’s licentiate thesis [? ]. Chapter 2 offers a background on WebAssembly and the latest advancements in Software Diversification. Chapter 3 delves into our technical contributions. Chapter 4 exhibits two use cases applying our technical contributions. Chapter 5 concludes the thesis and outlines future research directions. The second part of this thesis incorporates all the papers discussed in part one.